

WHAT IS CLAIMED IS:

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1. A method for manufacturing an exposure apparatus comprising the steps of:
- 5 a providing step for providing a projection system projecting and exposing an image of a predetermined pattern formed on a reticle to a photosensitive substrate;
- 10 a setting step for setting a correction member correcting residual aberration in said projection system at a predetermined position between a reticle setting position where said reticle is set and a substrate setting position where said photosensitive substrate is set; and
- 15 a correcting step for correcting degradation of optical characteristic of said projection system caused by setting said correction member at said predetermined position;
- wherein said correcting step includes a first adjusting step for adjusting at least one of said reticle setting position and said substrate setting position.
2. The method for manufacturing an exposure apparatus according to claim 1, wherein said correcting step further includes a second adjusting step for adjusting said projection system for correcting degradation of said optical characteristic unable to be corrected by said first adjusting step.
- 20 3. The method for manufacturing an exposure apparatus according to claim 1; wherein said correcting step further includes a first calculating step, prior to said setting step, for calculating an adjusting amount of at least one of said reticle setting position and said substrate setting position in order to correct degradation of said optical characteristic produced in accordance with the thickness of said correction member, and;
- 25 said first adjusting step includes a step for adjusting at least one of said reticle setting position and said substrate setting position based on first calculated information obtained in said first calculating step.
- 30 4. The method for manufacturing an exposure apparatus according to claim 1, and further comprising;
- a support member arranging step, prior to said setting step, for arranging a support member supporting said correction member in order to set said correction member at said predetermined position.
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5. The method for manufacturing an exposure apparatus according to claim 1; wherein said correcting step is performed prior to said setting step.

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6. The method for manufacturing an exposure apparatus according to claim 1; wherein said first adjusting step includes a step for moving at least one of a reticle stage for setting said reticle to said reticle setting position and a substrate stage for setting said photosensitive substrate to said substrate setting position.

7. The method for manufacturing a micro device comprising the steps of:  
a preparing step for preparing an exposure apparatus manufactured by using the method for manufacturing an exposure apparatus according to claim 1;  
10 a reticle setting step for setting a reticle at said reticle setting position;  
a substrate setting step for setting a photosensitive substrate at said substrate setting position;  
an exposing step for exposing a pattern image of said reticle to said photosensitive substrate by using a projection system of an exposure apparatus prepared in said preparing step; and  
15 a developing step for developing said photosensitive substrate exposed by said exposing step.

8. A method for manufacturing a micro device comprising the steps of:  
a preparing step for preparing an exposure apparatus manufactured by using the method for manufacturing an exposure apparatus according to claim 3;  
20 a reticle setting step for setting a reticle at said reticle setting position;  
a substrate setting step for setting a photosensitive substrate at said substrate setting position;  
an exposing step for exposing a pattern image of said reticle to said photosensitive substrate by using a projection system of an exposure apparatus prepared in said preparing step; and  
25 a developing step for developing said photosensitive substrate exposed by said exposing step.

9. A method for manufacturing a micro device comprising the steps of:  
30 a preparing step for preparing an exposure apparatus manufactured by using the method for manufacturing an exposure apparatus according to claim 4;  
a reticle setting step for setting a reticle at said reticle setting position;

a substrate setting step for setting a photosensitive substrate at said substrate setting position;

an exposing step for exposing a pattern image of said reticle to said photosensitive substrate by using a projection system of an exposure apparatus prepared in said preparing step; and

a developing step for developing said photosensitive substrate exposed by said exposing step.

10. The method for manufacturing a micro device comprising the steps of:  
a preparing step for preparing an exposure apparatus manufactured by  
10 using the method for manufacturing an exposure apparatus according to claim 5;

a reticle setting step for setting a reticle at said reticle setting position;  
a substrate setting step for setting a photosensitive substrate at said substrate setting position;

15 an exposing step for exposing a pattern image of said reticle to said photosensitive substrate by using a projection system of an exposure apparatus prepared in said preparing step; and

a developing step for developing said photosensitive substrate exposed by said exposing step.

11. The method for manufacturing a micro device comprising the steps of:  
20 a preparing step for preparing an exposure apparatus manufactured by using the method for manufacturing an exposure apparatus according to claim 6;

a reticle setting step for setting a reticle at said reticle setting position;  
a substrate setting step for setting a photosensitive substrate at said substrate setting position;

25 an exposing step for exposing a pattern image of said reticle to said photosensitive substrate by using a projection system of an exposure apparatus prepared in said preparing step; and

a developing step for developing said photosensitive substrate exposed by said exposing step.

30 12. The method for manufacturing an exposure apparatus according to claim 2;

wherein said correcting step further includes a first calculating step, prior to said setting step, for calculating an adjusting amount of at least one of said

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17. The method for manufacturing an exposure apparatus according to claim 12; wherein said correcting step further includes a second calculating step, prior to said setting step, for calculating an adjusting amount of said projection system so as to correct degradation of said optical characteristic unable to be corrected by said first adjusting step; and

said second adjusting step includes a step for adjusting said projection system based on second calculated information obtained in said second calculating step.

18. The method for manufacturing a micro device comprising the steps of:  
a preparing step for preparing an exposure apparatus manufactured by using the method for manufacturing an exposure apparatus according to claim 12;  
a reticle setting step for setting a reticle at said reticle setting position;  
a substrate setting step for setting a photosensitive substrate at said substrate setting position;

an exposing step for exposing a pattern image of said reticle to said photosensitive substrate by using a projection system of an exposure apparatus prepared in said preparing step; and

a developing step for developing said photosensitive substrate exposed by said exposing step.

19. The method for manufacturing an exposure apparatus according to claim 17; wherein said second adjusting step includes a step for adjusting at least one optical member of said projection system.

20. The method for manufacturing a micro device comprising the steps of:  
a preparing step for preparing an exposure apparatus manufactured by using the method for manufacturing an exposure apparatus according to claim 17;  
a reticle setting step for setting a reticle at said reticle setting position;  
a substrate setting step for setting a photosensitive substrate at said substrate setting position;

an exposing step for exposing a pattern image of said reticle to said photosensitive substrate by using a projection system of an exposure apparatus prepared in said preparing step; and

a developing step for developing said photosensitive substrate exposed by said exposing step.

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a processing step for processing a correction member for correcting said residual aberration in said projection system based on measured information obtained in said measuring step;

an inserting step for inserting a correction member obtained in said processing step at a predetermined position between a reticle setting position where said reticle is set and a substrate setting position where said photosensitive substrate is set; and

5 a first adjusting step for adjusting at least one of said reticle setting position and said substrate setting position in accordance with a change in an object-to-image distance of said projection system produced by inserting said correction member.

26. The method for manufacturing an exposure apparatus according to  
10 claim 25, and further comprising;

a second adjusting step for adjusting said projection system so as to correct degradation of optical characteristic of said projection system produced by inserting said correction member in said inserting step.

27. The method for manufacturing an exposure apparatus according to  
15 claim 25, and further comprising;

a first calculating step, prior to said measuring step, said processing step and said inserting step, for calculating an amount of change in an object-to-image distance of said projection system produced by inserting said correction member;

wherein said first adjusting step includes a step, prior to said measuring  
20 step, said processing step and said inserting step, for adjusting at least one of said reticle setting position and said substrate setting position based on first calculated information obtained in said first calculating step.

28. The method for manufacturing an exposure apparatus according to  
claim 25, and further comprising;

25 a first calculating step, independent from said measuring step, said processing step and said inserting step, for calculating an amount of change in an object-to-image distance of said projection system produced by inserting said correction member;

wherein said first adjusting step includes a step for adjusting at least one  
30 of said reticle setting position and said substrate setting position based on first calculated information obtained by said first calculating step.

29. The method for manufacturing an exposure apparatus according to  
claim 25, and further comprising;

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a support member arranging step, prior to said measuring step, for arranging a support member supporting said correction member in order to set said correction member at said predetermined position.

5           30.    The method for manufacturing an exposure apparatus according to claim 25; wherein said first adjusting step includes a step for moving at least one of a reticle stage for setting said reticle to said reticle setting position and a substrate stage for setting said photosensitive substrate to said substrate arranging position.

10           31.    The method for manufacturing a micro device comprising the steps of:  
               a preparing step for preparing an exposure apparatus manufactured by  
               using the method for manufacturing an exposure apparatus according to claim 25;  
               a reticle setting step for setting a reticle at said reticle setting position;  
               a substrate setting step for setting a photosensitive substrate at said  
               substrate setting position;  
               an exposing step for exposing a pattern image of said reticle to said  
 15           photosensitive substrate by using a projection system of an exposure apparatus  
               prepared in said preparing step; and  
               a developing step for developing said photosensitive substrate exposed  
               by said exposing step.

20           32.    The method for manufacturing a micro device comprising the steps of:  
               a preparing step for preparing an exposure apparatus manufactured by  
               using the method for manufacturing an exposure apparatus according to claim 27;  
               a reticle setting step for setting a reticle at said reticle setting position;  
               a substrate setting step for setting a photosensitive substrate at said  
               substrate setting position;  
 25           an exposing step for exposing a pattern image of said reticle to said  
               photosensitive substrate by using a projection system of an exposure apparatus  
               prepared in said preparing step; and  
               a developing step for developing said photosensitive substrate exposed  
               by said exposing step.

30           33.    The method for manufacturing a micro device comprising the steps of:  
               a preparing step for preparing an exposure apparatus manufactured by  
               using the method for manufacturing an exposure apparatus according to claim 28;  
               a reticle setting step for setting a reticle at said reticle setting position;



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a developing step for developing said photosensitive substrate exposed by said exposing step.

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a developing step for developing said photosensitive substrate exposed by said exposing step.

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a developing step for developing said photosensitive substrate exposed by said exposing step.

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a first calculating step, prior to said measuring step, said processing step and said inserting step, for calculating an amount of change in an object-to-image distance of said projection system produced by inserting said correction member;

wherein said first adjusting step includes a step, prior to said measuring step, said processing step and said inserting step, for adjusting at least one of said reticle setting position and said substrate setting position based on first calculated information obtained in said first calculating step.

37. The method for manufacturing an exposure apparatus according to claim 26, and further comprising;

a second calculating step, prior to said measuring step, said processing step and said inserting step, for calculating an amount of adjustment for said projection system for correcting degradation of optical characteristic of said projection system produced by inserting said correction member;

wherein said second adjusting step includes a step, prior to said measuring step, said processing step and said inserting step, for adjusting said projection system based on second calculated information obtained in said second calculating step.

38. The method for manufacturing an exposure apparatus according to claim 26, and further comprising;

a first calculating step, independent from said measuring step, said processing step and said inserting step, for calculating an amount of change in an object-to-image distance of said projection system produced by inserting said correction member;

wherein said first adjusting step includes a step for adjusting at least one of said reticle setting position and said substrate setting position based on first calculated information obtained in said first calculating step.

39. The method for manufacturing an exposure apparatus according to claim 38, and further comprising;

a second calculating step, independent from said measuring step, said processing step and said inserting step, for calculating an amount of adjustment for said projection system so as to correct degradation of optical characteristic of said projection system produced by inserting said correction member;

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wherein said second adjusting step includes a step for adjusting said projection system based on second calculated information obtained in said second calculating step.

40. The method for manufacturing a micro device comprising the steps of:  
 a preparing step for preparing an exposure apparatus manufactured by using the method for manufacturing an exposure apparatus according to claim 39;  
 a reticle setting step for setting a reticle at said reticle setting position;  
 a substrate setting step for setting a photosensitive substrate at said substrate setting position;

an exposing step for exposing a pattern image of said reticle to said photosensitive substrate by using a projection system of an exposure apparatus prepared in said preparing step; and

a developing step for developing said photosensitive substrate exposed by said exposing step.

41. The method for manufacturing a micro device comprising the steps of:  
 a preparing step for preparing an exposure apparatus manufactured by using the method for manufacturing an exposure apparatus according to claim 26;  
 a reticle setting step for setting a reticle at said reticle setting position;  
 a substrate setting step for setting a photosensitive substrate at said substrate setting position;

an exposing step for exposing a pattern image of said reticle to said photosensitive substrate by using a projection system of an exposure apparatus prepared in said preparing step; and

a developing step for developing said photosensitive substrate exposed by said exposing step.

42. The method for manufacturing an exposure apparatus according to claim 25, wherein said measuring step includes;

a step for measuring residual aberration in said projection system in a state in which an optical member exclusively for measurement having same optical thickness as said correction member is inserted at on said predetermined position.

43. The method for manufacturing a micro device comprising the steps of:  
 a preparing step for preparing an exposure apparatus manufactured by using the method for manufacturing an exposure apparatus according to claim 42;

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a reticle setting step for setting a reticle at said reticle setting position;  
 a substrate setting step for setting a photosensitive substrate at said  
 substrate setting position;

an exposing step for exposing a pattern image of said reticle to said  
 photosensitive substrate by using a projection system of an exposure apparatus  
 prepared in said preparing step; and

a developing step for developing said photosensitive substrate exposed  
 by said exposing step.

44. The method for manufacturing an exposure apparatus according to  
 claim 25, wherein said measuring step includes;

a step for measuring residual aberration of said projection system in a  
 state in which an unprocessed correction member in said processing step is being  
 inserted into said predetermined position.

45. The method for manufacturing a micro device comprising the steps of:  
 a preparing step for preparing an exposure apparatus manufactured by  
 using the method for manufacturing an exposure apparatus according to claim 44;

a reticle setting step for setting a reticle at said reticle setting position;  
 a substrate setting step for setting a photosensitive substrate at said  
 substrate setting position;

an exposing step for exposing a pattern image of said reticle to said  
 photosensitive substrate by using a projection system of an exposure apparatus  
 prepared in said preparing step; and

a developing step for developing said photosensitive substrate exposed  
 by said exposing step.

46. The method for manufacturing an exposure apparatus according to  
 claim 36, and further comprising;

a second calculating step, prior to said measuring step, said processing  
 step and said inserting step, for calculating an amount of adjustment with respect to  
 said projection system so as to correct degradation of optical characteristic of said  
 projection system produced by inserting said correction member;

wherein said second adjusting step includes a step, prior to said  
 measuring step, said processing step and said inserting step, for adjusting said

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projection system based on second calculated information obtained in said second calculating step.

47. The method for manufacturing an exposure apparatus according to claim 46, wherein said measuring step includes;

5 a step for measuring residual aberration in said projection system in a state in which an optical member exclusively for measurement having same optical thickness as said correction member is inserted into said predetermined position.

48. The method for manufacturing an exposure apparatus according to claim 46, wherein said measuring step includes;

10 a step for measuring residual aberration in said projection system in a state in which an unprocessed correction member in said processing step is being inserted into said predetermined position.

49. The method for manufacturing a micro device comprising the steps of:  
a preparing step for preparing an exposure apparatus manufactured by  
15 using the method for manufacturing an exposure apparatus according to claim 46;  
a reticle setting step for setting a reticle at said reticle setting position;  
a substrate setting step for setting a photosensitive substrate at said substrate setting position;

20 an exposing step for exposing a pattern image of said reticle to said photosensitive substrate by using a projection system of an exposure apparatus prepared in said preparing step; and

a developing step for developing said photosensitive substrate exposed by said exposing step.

50. A method for manufacturing an exposure apparatus comprising the  
25 steps of:

a measuring step for measuring optical capability of a projection system projecting and exposing an image of a predetermined pattern formed on a reticle to a photosensitive substrate;

30 an improving step for improving optical capability of said projection system based on measurement result by said measuring step;

an adjusting step for adjusting illumination characteristic for illuminating said reticle in accordance with said improving step.

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an arranging step for arranging a processed correction member based on measurement result in said measuring step in order to correct residual aberration in said projection system.

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a step for processing at least one optical member in said projection system based on measured result by said measuring step in order to correct residual aberration in said projection system.

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an exposing step for exposing a pattern image of said reticle to said photosensitive substrate by using a projection system of an exposure apparatus prepared in said preparing step; and

a developing step for developing said photosensitive substrate exposed by said exposing step.

54. The method for manufacturing a micro device comprising the steps of:  
a preparing step for preparing an exposure apparatus manufactured by  
using the method for manufacturing an exposure apparatus according to claim 51;

a reticle setting step for setting a reticle at said reticle setting position;  
a substrate setting step for setting a photosensitive substrate at said substrate setting position;

an exposing step for exposing a pattern image of said reticle to said photosensitive substrate by using a projection system of an exposure apparatus prepared in said preparing step; and

a developing step for developing said photosensitive substrate exposed by said exposing step.

55. The method for manufacturing a micro device comprising the steps of:

a preparing step for preparing an exposure apparatus manufactured by using the method for manufacturing an exposure apparatus according to claim 52;

a reticle setting step for setting a reticle at said reticle setting position;

a substrate setting step for setting a photosensitive substrate at said substrate setting position;

an exposing step for exposing a pattern image of said reticle to said photosensitive substrate by using a projection system of an exposure apparatus prepared in said preparing step; and

a developing step for developing said photosensitive substrate exposed by said exposing step.

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